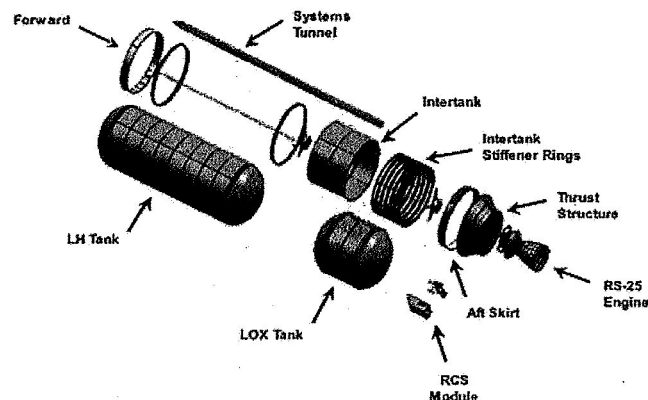


Crew Launch Vehicle Upper Stage

The Agency's Crew Launch Vehicle (CLV) will be the first human rated space transportation system developed in the United States since the Space Shuttle. The CLV will utilize existing Shuttle heritage hardware and systems combined with a "clean sheet design" for the Upper Stage. The Upper Stage element will be designed and developed by a team of NASA engineers managed by the Marshall Space Flight Center (MSFC) in Huntsville, Alabama.

The team will design the Upper Stage based on the Exploration Systems Architecture Study (ESAS) Team's point of departure conceptual design as illustrated in the figure below. This concept is a self-supporting cylindrical structure, approximately 115 feet long and 216 inches in diameter. It is powered by a single RS-25 (SSME) and consists of the following subsystems:

- Primary Structures
 - LOX Tank
 - LH2 Tank
 - Intertank
 - Thrust Structure
 - Spacecraft Payload Adaptor
 - Interstage
 - Forward and Aft Skirts
- Secondary Structures
 - Systems Tunnel
- Avionics and Software
- Main Propulsion System (MPS)
- Reaction Control System (RCS)
- TVC, Auxiliary Power Unit (APU), Hydraulic Systems



While this “clean-sheet” upper stage design inherently carries more risk than utilizing a modified design, the approach also has many advantages.

This paper will discuss the advantages and disadvantages of pursuing a “clean-sheet” design for the new CLV Upper Stage as well as describe in detail the overall design of the Upper Stage and its integration into NASA’s CLV.